

ROBERT E. BUSHNELL\*†

JOSEPH G. SEEBER°  
JOHN C. BROSKY°+\*  
DARREN R. CREW+\*  
MATTHEW J. LESTINA†\*  
SARYADVINDER S. SAHOTA†\*  
RICHARD H. STERN°

MICHAEL D. PARKER  
DANIEL A. GESELOWITZ, Ph.D.  
(REG. PATENT AGENTS)

† ADMITTED IN MARYLAND  
° ADMITTED IN VIRGINIA  
+ ADMITTED IN PENNSYLVANIA  
‡ ADMITTED IN NEW YORK  
¤ ADMITTED IN CONNECTICUT  
\* NOT ADMITTED IN D.C.

Assistant Commissioner for Patents  
Washington, D.C. 20231

R. E. BUSHNELL

ATTORNEY AT LAW

1522 K STREET, N.W., SUITE 300  
WASHINGTON, D.C. 20005-1202  
UNITED STATES OF AMERICA

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INTELLECTUAL PROPERTY LAW

TELEPHONE (202) 408-9040  
FACSIMILE (202) 289-7100  
FACSIMILE (202) 628-3835  
FACSIMILE (410) 747-0022  
E-MAIL: REBUSHNELL@AOL.COM

- ☐ U.S. Postal Service  
☐ Via Local Courier  
☐ Via International Courier  
☐ Via Facsimile No. \_\_\_\_\_  
☐ Via E-Mail Attachment  
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Attorney Docket: P56133

Sir:

Submitted herewith is the following patent application:

**Inventor:** 1) JANG-HO PARK  
2) DONG-WOOK KIM

**Title:** PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-  
ON SELF-TEST STATE ON LED INDICATOR

Please find attached hereto an application for patent which includes: Specification and Abstract, Claims, and a certified copy of the foreign priority document identified below:

Also, please enter the attached Preliminary Amendment, prior to calculating the filing fee for the application.

Verified Showing of Small Entity Status: **NO**

Drawings: Formal drawings, 5 sheets, Figures 1-7

Claim of priority under 35 U.S.C. §119: **YES**

\*\* The Republic Of Korea Application No. 28925/1999 filed on 16 July 1999.

**FEE (see formula below): CHECK IS NOT ENCLOSED**

Basic Fee \$345/690 ..... \$690.00

**Additional Fees:**

Total number of claims in excess of 20: 3 times \$9/18 . \$54.00

Number of independent claims in excess of 3:     times \$39/78 ..... \$0.00

Multiple Dependent Claims \$130/260 ..... \$0.00

An Assignment is likewise enclosed: Recording Fee \$40 . . \$0.00

Filing Non-English specification ..... \$0.00

**TOTAL FEES FOR THE ABOVE APPLICATION ..... \$744.00**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

JANG-HO PARK et al.

Serial No.: *To be assigned*

Examiner: *To be assigned*

Filed: 14 July 2000

Art Unit: *To be assigned*

For: PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-ON SELF-TEST  
STATE ON LED INDICATOR

**PRELIMINARY AMENDMENT**

Assistant Commissioner of Patents  
Washington, D.C. 20231

Sir:

Preliminary to the examination, entry of the following amendments and/or remarks is respectfully requested, prior to calculation of the application filing fee.

Folio: P56133  
Date: 7/14/00  
I.D.: REB/SS/sb

IN THE SPECIFICATION

Please enter a change in the specification, as follows:

Page 1, line 6, change "*PORTABLE COMPUTER SYSTEM FOR  
INDICATING POWER-ON SELF-TEST STATE ON LED  
INDICATOR*" to *--PORTABLE COMPUTER DISPLAYING  
POST CODE ON LED INDICATOR--*.

**IN THE CLAIMS**

Please amend claims 1 and 15, as follows:

1. (Amended) A portable computer system comprising:  
an indicating device having a plurality of light emitting devices activated according to a  
signal from the portable computer system; and  
a controller managing said indicating device to display power-on self-test (POST) codes in  
response to operating states of the portable computer system, the power-on self-test codes being  
generated in power-on self-test [codes] process by a basic input-output system (BIOS) of the  
computer system.

15. (Amended) The portable computer of claim 14, with the lighting devices being a  
plurality of light emitting diodes displaying the power-on self-test codes in accordance with an order  
of the power-on self-test [codes] process.

REMARKS

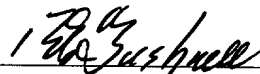
Claims 1 through 23 are pending in this application. Claims 1 and 15 are amended in several particulars for purposes of clarity in accordance with current Office policy, to assist the examiner and to expedite compact prosecution of this application.

A minor correction of the name of the application in the Claim of Priority was made to correspond to the originally filed Korean application.

If there are any questions, the examiner is asked to contact the applicant's attorney.

No fees are incurred by this Amendment.

Respectfully submitted,



Robert E. Bushnell  
Attorney for the Applicant  
Registration No.: 27,774

1522 "K" Street N.W., Suite 300  
Washington, D.C. 20005  
(202) 408-9040

Folio: P56133  
Date: 7/14/00  
I.D.: REB/SS

Assistant Commissioner for Patents

14 July 2000

Page Two

Docket No.: P56133

**Inventor:**     1) JANG-HO PARK  
                      2) DONG-WOOK KIM

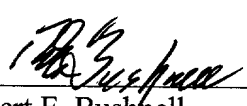
**Title:**            PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-  
                         ON SELF-TEST STATE ON LED INDICATOR

In view of the above, it is requested that this application be accorded a filing date pursuant to 37 CFR 1.53(b).

Please address all correspondence to:

Robert E. Bushnell  
1522 K Street, N.W.  
Suite 300  
Washington, D.C. 20005

Respectfully submitted,

  
\_\_\_\_\_  
Robert E. Bushnell  
(Registration No. 27,774)  
Payor No.: 008-439  
Attorney for the Applicant  
1522 K Street, N.W.  
Suite 300  
Washington, D.C. 20005

Telephone:    (202) 408-9040  
Telefacsimile: (202) 628-0755

REB/sb

**TITLE OF THE INVENTION**

**PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-ON  
SELF-TEST STATE ON LED INDICATOR**

**CLAIM OF PRIORITY**

This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from my application *PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-ON SELF-TEST STATE ON LED INDICATOR* filed with the Korean Industrial Property Office on 16 July 1999 and there duly assigned Serial No. 28925/1999.

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

The present invention relates to a data processing system, and more particularly to a portable computer system with a diagnostic routine.

**Related Art**

When a computer system is first turned on, a Basic Input/Output System (BIOS) is enabled. A BIOS program is a set of programs usually stored permanently in a read only memory (ROM) that provides the most basic control and management of the computer's hardware. The first job of a BIOS program is to initialize and to configure the computer hardware when the user turns on the computer (i.e., system boot). The BIOS program runs a startup program called a Power-On Self-Test (POST)

program.

POST is a sequence of program routines built into the motherboard's ROM (i.e., BIOS). The POST tests vital system parts at the time of power-on. These specific tests scrutinize the main elements in the system such as CPU (central processing unit), ROM (read only memory), motherboard support circuitry, memory, keyboard, video, hard and floppy drives, etc. An example of the POST process is disclosed in U. S. Pat. No. 5,704,035 for *Computer Method/Apparatus for Performing a Basic Input/Output System (BIOS) Power on Test (POST) That Uses Three Data Patterns and Variable Granularity* issued to Shipman, issued on Dec. 30, 1997. When a fault is discovered in the POST process, the BIOS provides a warning or error message. Three types of output messages including audio codes, display screen messages and test codes are provided. The test codes are POST codes sent to an input/output (I/O) port address (e.g., I/O port 80h) at the start of each test. For example, in AwardBIOS™ Version 4.51PG of Phoenix Technologies, Ltd., Extended Industry Standard Architecture (EISA) POST codes are typically outputted to port address 300h and Industry Standard Architecture (ISA) POST codes are outputted to port address 80h.

A special adapter card plugged into a system slot can decode the POST codes. These codes pinpoint each element tested by POST. During the POST process, two-digit numeric codes are passed to the adapter's display. If the POST cycle stops unexpectedly, the two-digits displayed on the card indicates where the test has failed, and therefore points an accusing finger at the faulty component. Generally, the adapter card is called a POST card.

Many commercial POST cards exist to inform the user of the POST codes. The majority of



these display the codes on a pair of seven segment displays, and the user has to then look up their meaning. The POST card can be used in a computer system including an 80286, 80386, 80486 or PENTIUM micro-processors with an ISA or an EISA bus.

Generally, the POST card is provided in the shape of an add-in card plugged in an extension slot. For example, in case of a desktop computer, the POST card can be easily plugged in the extension slot, since the majority of desktop computers fundamentally equip the extension slot inside of them.

However, in case of a portable computer, such as a laptop computer and a notebook computer, the POST card is plugged in an extension slot coupled to a docking station. Therefore, the docking station is required essentially to plug the POST card. For example, if the docking station is not coupled to the portable computer system, the POST card cannot be plugged in the portable computer system. In that case, it is impossible to display the POST codes to a user. Thus, it is hard to identify where the error occurred in the computer system.

Exemplar of the art are U.S. Patent 6,073,255 for *Method of Reading System Log* issued to Nouri et al., U.S. Patent 6,035,355 for *PCI System and Adapter Requirements Following Reset* issued to Kelley et al., U.S. Patent 6,070,255 for *Error Protection Power-on-self-test for Memory Cards having ECC on Board* issued to Dell et al., U.S. Patent 5,860,001 for *Computer System having at Least Two Boot Sequences* issued to Cromer et al., U.S. Patent 5,978,913 for *Computer with Periodic Full Power-on Self Test* issued to Broyles et al., U.S. Patent 6,052,800 for *Method and System for Updating Information on an Intelligent Display Device Monitoring a Computer System*

1 issued to Gentile et al., U.S. Patent 5,742,616 for *System and Method Testing Computer Memories*  
2 issued to Torreiter et al. disclose methods and devices to perform power-on self-tests. I have noticed  
3 that the art does not show a device that displays the POST states in an easily manageable fashion.

#### 4 SUMMARY OF THE INVENTION

5 It is therefore an object of the present invention to provide a portable computer system for  
6 informing POST state to a user through an LED (light emitting diode) indicator.

7 It is another object to provide a POST code display method of a portable computer system  
8 for informing POST state to a user through an LED indicator.

9 It is yet another object to provide a way of showing the POST state without using the display  
10 monitor of a portable computer system.

11 It is still yet another object to provide a quick and easy way of monitoring the POST state  
12 without extra attachments to a portable computer system.

13 It is another object to have POST code display that a user can recognize the location of the  
14 faulty part in a portable computer without referencing additional literature showing the location of  
15 the error.

16 In order to attain the above objects, according to an aspect of the present invention, there is  
17 provided a portable computer system having an LED indicator including a plurality of lighting  
18 devices, and a micro-controller for controlling the LED indicator to display POST codes in response  
19 to operating states of the portable computer system.

1 According to another aspect of this invention, there is provided a method for displaying  
2 POST codes in a portable computer system. The method has the steps of starting the POST process;  
3 generating POST codes; outputting the POST codes to a microprocessor to display the POST codes;  
4 testing each of elements of the portable computer system corresponding to the respective POST  
5 codes; determining whether the test is performed in safety; completing the POST process, if the test  
6 is performed in safety in all of the elements; and interrupting the POST process, if the test is not  
7 performed in safety in any element. The outputted POST codes are displayed through an LED  
8 indicator.

### 9 BRIEF DESCRIPTION OF THE DRAWINGS

10 A more complete appreciation of this invention, and many of the attendant advantages  
11 thereof, will be readily apparent as the same becomes better understood by reference to the following  
12 detailed description when considered in conjunction with the accompanying drawings in which like  
13 reference symbols indicate the same or similar components, wherein:

14 Fig. 1 is an exterior view of a portable computer system;

15 Fig. 2 is an enlarged diagram for illustrating the LED indicator shown in Fig. 1;

16 Fig. 3 is a block diagram for illustrating a structure of a portable computer system according  
17 to a first embodiment of the present invention;

18 Fig. 4 is a flowchart for illustrating POST process performed in the portable computer system  
19 shown in Fig. 3;

Fig. 5 is a flowchart for illustrating control process of the micro-processor to display the POST codes through the LED indicator;

Fig. 6 is a block diagram for illustrating a structure of a circuit to control the LED indicator according to a second embodiment of the present invention; and

Fig. 7 is a block diagram for illustrating a modified structure of the circuit shown in Fig. 6.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings, Fig. 1 is an exterior view for illustrating a portable computer system 100 including a liquid crystal display (LCD) panel 105 and a main body 110. In addition, the portable computer system 100 includes a light emitting diode (LED) indicator 120. The LED indicator 120 is composed of a plurality of LEDs for illustrating operating states of a hard disk drive or a floppy disk drive, and so on. Such LEDs are arranged in series on a surface of the portable computer system 100. Referring to Fig. 1, an LED indicator 120 is located in upper part of the main body 110. However, the LED indicator 120 is capable of being located in any one side of the main body 110.

Fig. 2 is an enlarged diagram for illustrating the LED indicator 120 shown in Fig. 1. As shown in Fig. 2, the LED indicator 120 has a plurality of LEDs 121, 122, 123, 124, 125 and 126. The LEDs indicate a power on/off state 121, a number lock state 122, a capital letter lock state 123, a scroll lock state 124, an access state of a hard disk drive, a floppy disk drive or a CD-ROM drive 125, and a charge state of a battery 126, respectively.

A portable computer system according to the present invention displays POST codes generated in a POST process through the LED indicator 120 by lighting corresponding LEDs. When the POST process is performed, each of LEDs are lighted in response to the POST codes. According to the lighting state of the LED indicator 120, a user can identify current processing steps of the POST process. In addition, when the POST process is stopped because of a detected hardware error, a user can verify which component of the computer system has an error by the LED indicator 120.

Fig. 3 is a block diagram for illustrating a structure of a portable computer system according to a first embodiment of the present invention. Referring to Fig. 3, the computer system has a central processing unit (CPU) 140 coupled to a HOST bus 130, a HOST-TO-PCI bridge controller 150 coupled between the HOST bus 130 and a PCI (Peripheral Component Interconnection) bus 132, and a PCI-TO-ISA bridge controller 160 coupled between the PCI bus 132 and an ISA bus 134.

To the HOST-TO-PCI bridge controller 150, a graphics controller 152 and a memory 156 are coupled, respectively. The graphics controller 152 is coupled to a liquid crystal display (LCD) 154. To the ISA bus 134, a BIOS ROM 170, an I/O controller 180 and a micro-controller 190 are coupled, respectively. The I/O controller 180 is coupled to a floppy disk drive (FDD) 182, a serial input output (SIO) port 184 and a parallel input output (PIO) port 186, respectively. In addition, the micro-controller 190 is coupled to a keyboard 192, a mouse 194, and an LED indicator 120, respectively.

The computer system performs a POST process when the system is powered on or reset. In the POST process, the BIOS 170 generates POST codes to I/O ports 80h and 64h, respectively. The

I/O port 80h is assigned for an external POST card (not shown), and the I/O port 64h is assigned for the micro-controller 190. The micro-controller 190 receives POST codes through the I/O port 64h during the POST process, and controls the LED indicator 120 to indicate the POST codes by lighting the LEDs.

Fig. 4 is a flowchart for illustrating POST process performed in the portable computer system shown in Fig. 3. Referring to Fig. 4, the portable computer system according to the present invention performs diagnostic routines (i.e., the POST process) stored in the BIOS 170, under control of the CPU 140. At step S100, POST process is started, and a POST code is generated in step S110. In that case, the POST code corresponds to a component to be tested in the POST process. At step S120, the generated POST code is outputted to the I/O port 80h. In addition, at step S130, the POST code being the same as the POST codes of the I/O port 80h is outputted to the I/O port 64h.

Continually, at step S140, a test is performed for an element of the portable computer system corresponding to the POST code, such as a memory, various kinds of drives, a graphics controller, and various kinds of chip sets. At step S150, it is determined whether the test is performed in safety. If so, the control flow proceeds to the next query step S160, where it is determined whether the POST process is completed. In other words, at step S160, it is determined whether all components of the portable computer system are tested. If any component is not tested yet, the control flow continues to step S110, where the POST process is performed, continually. In addition, if all components have been tested, the control flow continues to step S170, where the POST process is completed. However, if the test is not performed in safety in step S150, the control flow proceeds

to step S180, where the POST process is interrupted.

As described above, the micro-controller 190 receives the POST codes through the I/O port 64h, and displays the POST codes by lighting the LEDs of the LED indicator 120 in accordance with the POST process.

A control process of the micro-processor 190 for displaying the POST codes is illustrated in Fig. 5. Referring to Fig. 5, at step S200 the micro-controller 190 receives data through the I/O port 64h. At step S210, the micro-controller 190 generates an internal interrupt, when the data is inputted to the micro-controller 190. Continually, at step S220, the interrupt routine is performed. At step S230, it is determined whether the input data from the I/O port 64h is a POST code. If so, the control flow proceeds to step S240, where the micro-controller 190 controls the LED indicator 120 to display the POST code. If not, the control flow proceeds to step S250, where the micro-processor 190 executes other interrupt routines.

As described above, the micro-controller 190 displays the POST codes from the I/O port 64h, through the LED indicator 120. If the POST process is stopped by any detected error, a user can identify where the error has occurred in the computer system by the lighting state of the LED indicator 120.

According to the first embodiment of the present invention, the LED indicator 120 displays the POST codes, continually, during the POST process. However, it is possible to display the POST codes via the LED indicator 120, selectively, when a user wants. As shown in Fig. 3, the micro-processor 190 is coupled to the keyboard 192 so as to process key inputs. The micro-processor 190

1 can control the LED indicator 120 to indicate the POST code by lighting the LEDs, when a  
2 predetermined specific key code is inputted through the keyboard 192. One of the input keys of the  
3 keyboard is assigned as an input key to input the specific key code.

4 Fig. 6 is a block diagram for illustrating a structure of a circuit to control the LED indicator  
5 120 according to a second embodiment of the present invention. The circuit of Fig. 7 that modifies  
6 the circuit of Fig. 6, is capable of indicating POST codes to the LED indicator 120, selectively. In  
7 Figs. 6 and 7, the same parts as those shown in Fig. 3 are represented with like reference numerals  
8 and to avoid description duplication.

9 Referring to Fig. 6, the portable computer system has an address decoder 200 coupled to an  
10 ISA bus 134, a latch 210 and a multiplexer (MUX) 220, to indicate POST codes to the LED indicator  
11 120.

12 The address decoder 200 coupled to an address bus of the ISA bus 134 decodes an address  
13 signal from the ISA bus 134. The address decoder 200 enables the latch 210 when an address signal  
14 is loaded to the I/O port 80h. The latch 210 coupled to a data bus of the ISA bus 134 latches a data  
15 from the ISA bus 134, when the latch 210 is enabled by the address decoder 200. The multiplexer  
16 220 receives outputs of the micro-controller 190 and the latch 210, and outputs one of the data to the  
17 LED indicator 120, selectively. An output signal of the address decoder 200 is provided to the  
18 multiplexer 220 as a selection signal. The latched data of the latch 210 is outputted to the LED  
19 indicator 120 through the multiplexer 220 in response to the selection signal.

20 When the portable computer system is powered on or reset, the POST process is performed



1 by the BIOS, and POST codes generated in the POST process are outputted to the I/O port 80h.  
2 When the address signal of the I/O port 80h is loaded to the ISA bus 134, the latch 210 is enabled.  
3 The latch 210 latches the POST codes from the ISA bus 134. The multiplexer 220 outputs the  
4 latched POST codes to the LED indicator 120 to indicate the POST codes. After completing the  
5 POST process, an output direction of the multiplexer 220 is converted so as to output an LED  
6 indicator control signal to the LED indicator 120, where the LED indicator control signal is delivered  
7 from the micro-controller 190.

8 During the above described POST process according to the second embodiment of the  
9 present invention, the POST codes are displayed, continually, through the LED indicator 120.  
10 However, the POST codes can be displayed, selectively, when a user wants.

11 An example of a circuit for selective display of POST codes is illustrated in Fig. 7. Referring  
12 to Fig. 7, the micro-controller 190 controls the output of the multiplexer 220. The micro-controller  
13 190 coupled to a keyboard 192, processes a key input 260 from the keyboard 192. A specific key of  
14 the keyboard 192 is assigned to display the POST codes. In case of inputting the assigned specific  
15 key in the POST process, the micro-controller 190 switches the output of the multiplexer 220, so that  
16 the latched data (i.e., POST code) of the latch 210 is displayed through the LED indicator 120. In  
17 other words, POST codes of the POST process are displayed through the LED indicator 120 when  
18 a user wants the display. Therefore, the user can verify where the error has occurred in the computer  
19 system according to the lighting state of the LED indicator 120.

20 As described above, POST error can be verified through the LED indicator 120 without an

1 additional POST card. Therefore, a test of the portable computer can be performed, easily, in  
2 developing or producing of the portable computer without an additional post card.

3 It should be understood that the description of the preferred embodiments is merely  
4 illustrative and that it should not be taken in a limiting sense. In the above detailed description,  
5 several specific details are set forth in order to provide a thorough understanding of the present  
6 invention. It will be obvious, however, to one skilled in the art that the present invention may be  
7 practiced without these specific details.

8 While the invention has been described in terms of an exemplary embodiment, it is  
9 contemplated that it may be practiced as outlined above with modifications within the spirit and  
10 scope of the appended claims.

**WHAT IS CLAIMED IS :**

1           1.     A portable computer system comprising:  
2           an indicating device having a plurality of light emitting devices activated according to a  
3           signal from the portable computer system; and  
4           a controller managing said indicating device to display power-on self-test (POST) codes in  
5           response to operating states of the portable computer system, the power-on self-test codes being  
6           generated in power-on self-test codes process by a basic input-output system (BIOS) of the computer  
7           system.

1           2.     The portable computer system of claim 1, further comprising a key input device  
2           coupled to said controller, said key input activating a display of power-on self-test codes on the  
3           indicating device in response to a key input signal from the key input device.

1           3.     The portable computer system of claim 2, with the key input device being a keyboard  
2           of the portable computer system.

1           4.     The portable computer system of claim 1, with the operating states comprising of a  
2           power on or off state, number lock state, a capital letter state, a scroll lock state, an access state of  
3           a disk drive, and a charge state of the battery.

1           5.     The portable computer system of claim 4, with said indicating device being a  
2 plurality of light emitting diodes, with each power-on self-test code corresponding to a specific light  
3 emitting diode on the portable computer.

1           6.     The portable computer system of claim 5, with said light emitting diodes sequentially  
2 aligned along a surface of the portable computer according to an order of operating states being  
3 tested by the portable computer, the alignment accommodating a rapid view of a progress of the  
4 power-on self-test.

1           7.     The portable computer system of claim 6, with the light emitting diodes indicating  
2 where an error has occurred in the portable computer system.

1           8.     The portable computer of claim 1, said controller connected to a data bus located  
2 internally in the portable computer.

1           9.     A portable computer system, comprising:  
2 an address decoder coupled to an address bus generating a latch control signal by decoding  
3 an address of an output port accommodating power-on self-test codes;  
4 a latch coupled to a data bus of the portable computer system latching the power-on self-test

5 codes from the data bus in response to the latch control signal;  
6 an indicating device having a plurality of lighting devices indicating operating states of the  
7 portable computer system;  
8 a controller generating an indicating control signal in response to the operating state; and  
9 a selector sending either the indicating control signal or power-on self-test codes of the latch  
10 to said indicating device.

1 10. The portable computer system of claim 9, with the latched power-on self-test codes  
2 being outputted to the indicating device when the address decoder translates the address of the output  
3 port for power-on self-test codes.

1 11. The portable computer system of claim 9, with the controller managing the selector  
2 to output the power-on self-test codes latched in the latch during the power-on self-test process.

1 12. The portable computer system of claim 11, further comprising a key input device  
2 coupled to the controller, said controller regulating the selector to output the power-on self-test codes  
3 held temporarily until a key input signal response from the key input device during the power-on  
4 self-test process.

1 13. The portable computer system of claim 12, with the key input device being a

2 keyboard of the portable computer system.

1 14. The portable computer system of claim 13, with said selector being a multiplexer, the  
2 output of said multiplexer being controlled by the controller.

1 15. The portable computer of claim 14, with the lighting devices being a plurality of light  
2 emitting diodes displaying the power-on self-test codes in accordance with an order of the power-on  
3 self-test codes process.

1 16. A method of displaying power-on self-test codes in a portable computer system,  
2 comprising the steps of:

3 starting a power-on self-test process;

4 generating power-on self-test codes;

5 outputting the power-on self-test codes to a microprocessor to display the power-on self-test  
6 codes;

7 testing each one of the elements of the portable computer system corresponding to the  
8 respective power-on self-test codes;

9 determining whether the test is performed in safety;

10 completing the power-on self-test process if the test is performed in safety in all of the  
11 elements; and

12 interrupting the power-on self-test process if the test is not performed in safety in any  
13 element.

1 17. The method of claim 16, with the outputted power-on self-test codes being displayed  
2 through an indicator having a plurality of light emitting diodes (LED).

1 18. The method of claim 16, with said step of outputting the power-on self-test codes  
2 being made to an input-output port within the portable computer.

1 19. The method of claim 16, said step of displaying the power-on self-test codes further  
2 comprising:

3 receiving data through a predetermined input-output port of said microprocessor of the  
4 portable computer;

5 generating an internal interrupt when the data is inputted to said microprocessor;

6 checking whether the data inputted through the predetermined input-output port of the  
7 microprocessor is a power-on self-test code;

8 displaying the power-on self-test code through an indicator when data inputted is a power-on  
9 self-test code; and

10 executing other interrupt routines when data is not a power-on self-test code.

1           20.    The method of claim 19, with said indicator being a plurality of light emitting diodes,  
2    with each power-on self-test code corresponding to a specific light emitting diode on the portable  
3    computer.

1           21.    The method of claim 20, with said light emitting diodes sequentially aligned along  
2    a surface of the portable computer according to an order of operating states being tested by the  
3    portable computer, the alignment accommodating a rapid view of a progress of the power-on self-  
4    test.

1           22.    The method of claim 16, the tested elements comprising a memory, disk drive, and  
2    graphics controller.

1           23.    The method of claim 16, with the lighting devices continually displaying the power-  
2    on self-test codes during the power-on self-test process.



**ABSTRACT OF THE DISCLOSURE**

A portable computer system has a light emitting diode (LED) indicator including multiple LEDs to display a power-on self-test (POST) state and an operating state of the computer system. When the portable computer system performs a POST process during system boot, the LEDs of the LED indicator are lighted in response to each step of the POST process. If any error is detected in the POST process, the POST process is stopped with lighting LEDs. The lighting state of the LED indicator indicates where the error has occurred in the computer system, so that a user can verify which element of the computer system has an error, without additionally adding a POST card to the computer system.

Fig. 1

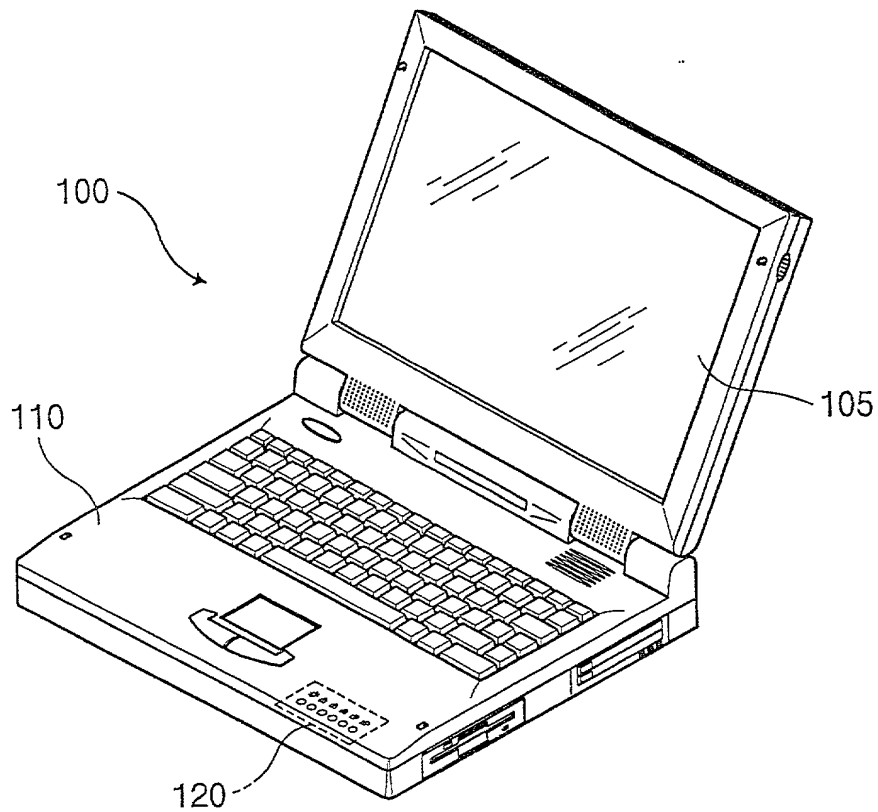


Fig. 2

LED Indicator 120

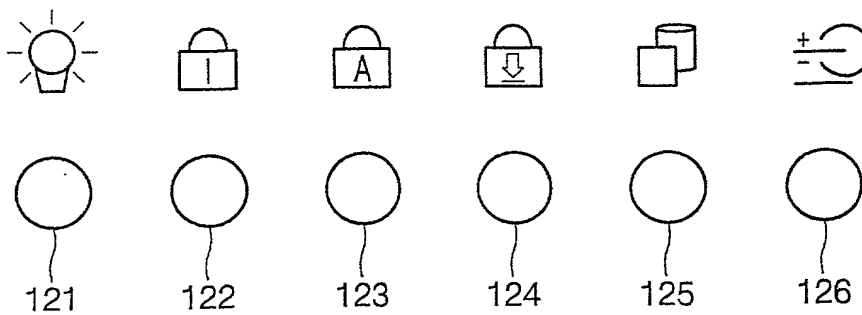


Fig. 3

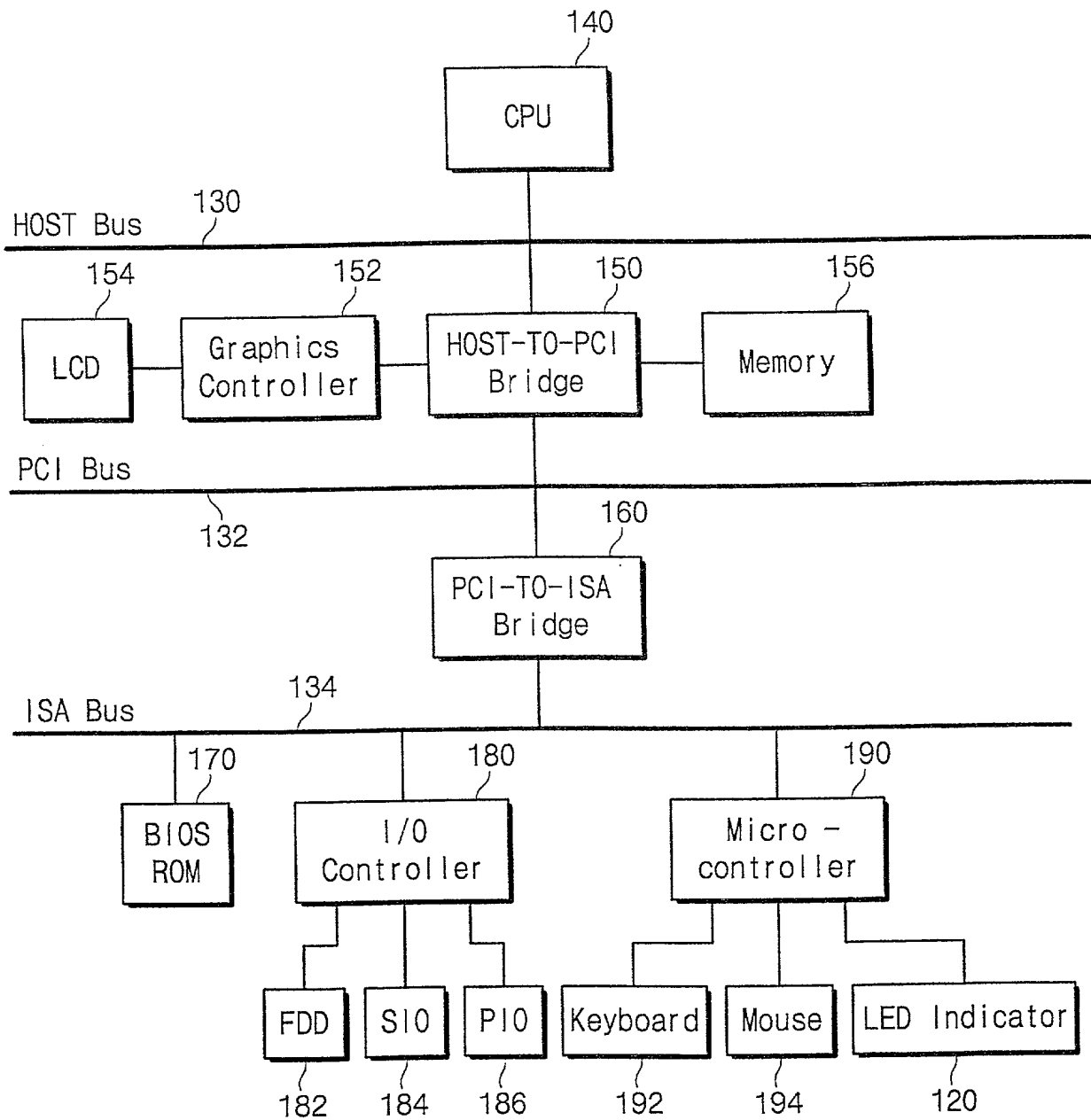


Fig. 4

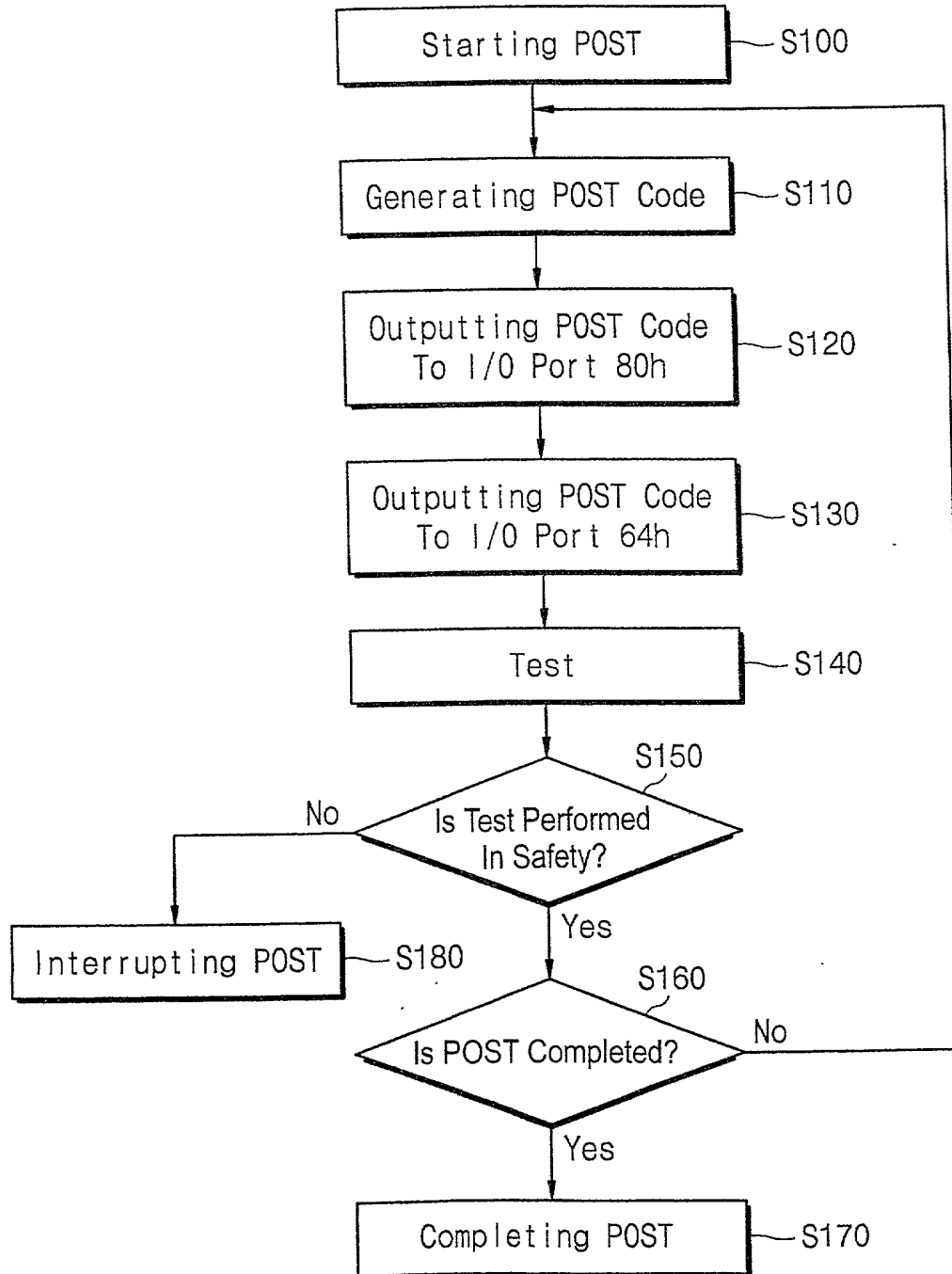


Fig. 5

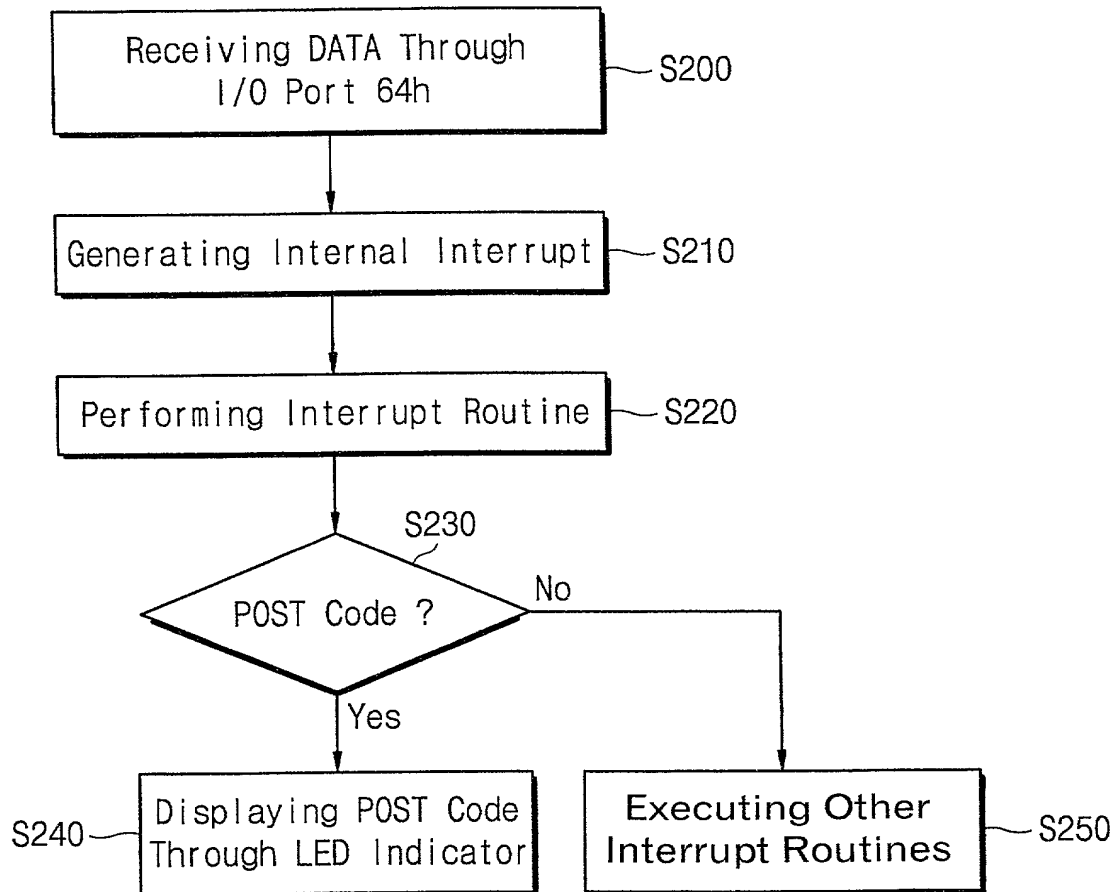


Fig. 6

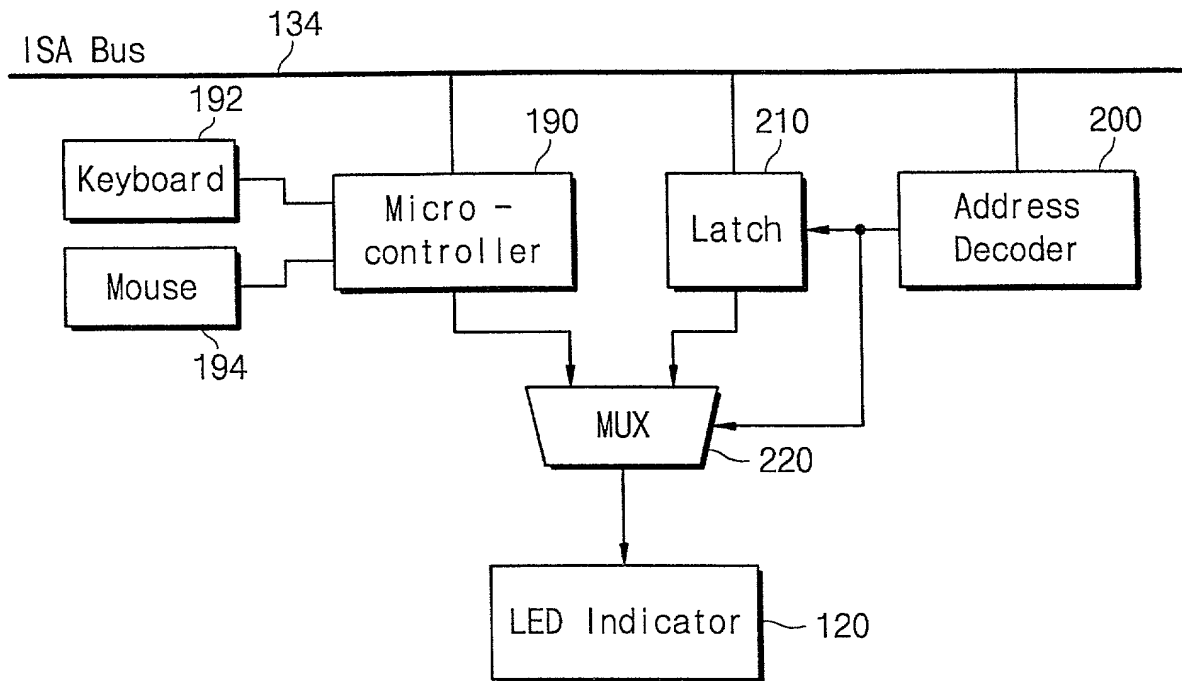
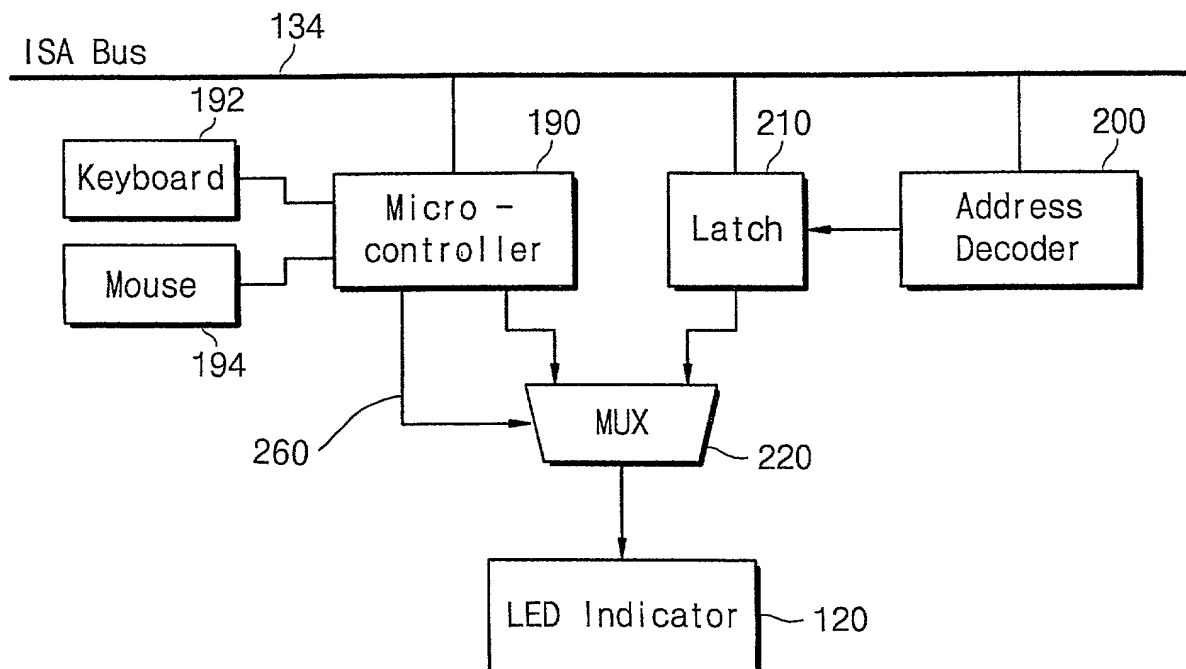


Fig. 7



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

JANG-HO PARK et al.

Serial No.: *To be assigned*

Examiner: *To be assigned*

Filed: 14 July 2000

Art Unit: *To be assigned*

For: PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-ON SELF-TEST  
STATE ON LED INDICATOR

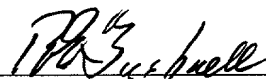
**TRANSMITTAL OF DECLARATION**

Assistant Commissioner  
for Patents  
Washington, D.C. 20231

Sir:

This transmittal accompanies an unexecuted Declaration for the above-captioned application.  
An executed Declaration will be filed upon receipt of the Serial No. for the above-captioned  
application.

Respectfully submitted,

  
Robert E. Bushnell,  
Attorney for the Applicant  
Registration No.: 27,774

Suite 300, 1522 "K" Street, N.W.  
Washington, D.C. 20005  
(202) 908-9040

Folio: P56133  
Date: 7/14/00  
I.D.: REB/sb

004720-0172560

AS A BELOW NAMED INVENTOR, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe that I am the original, first and sole (if only one name is listed below), or an original, first and joint inventor (if plural names are listed below), of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**TITLE: *PORTABLE COMPUTER SYSTEM FOR INDICATING POWER-ON SELF-TEST STATE ON LED INDICATOR***

the specification of which either is attached hereto or otherwise accompanies this Declaration, or:

☐ was filed in the U.S. Patent & Trademark Office on \_\_\_\_\_ and assigned Serial No. \_\_\_\_\_

☐ and (if applicable) was amended on \_\_\_\_\_

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability and to the examination of this application in accordance with Title 37 of the Code of Federal Regulations §1.56. I hereby claim foreign priority benefits under Title 35, U.S. Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, or §119(e) of any United States provisional application(s), listed below and have also identified below any foreign applications for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

28925/1999	Republic of KOREA	16 July 1999	Priority Claimed: Yes [ X ] No [ ]
(Application Number)	(Country)	(Day/Month/Year filed)	

_____	_____	_____	Yes [ ] No [ ]
(Application Number)	(Country)	(Day/Month/Year filed)	

_____	_____	_____	Yes [ ] No [ ]
(Application Number)	(Country)	(Day/Month/Year filed)	

I hereby claim the benefit under Title 35, U.S. Code, §120, of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, U.S. Code, §112, I acknowledge the duty to disclose information material to patentability as defined in Title 37, The Code of Federal Regulations, §1.56(a) which became available between the filing date of the prior application and the national or PCT international filing date of this application:

_____	_____	_____
(Application Serial No.)	(Filing Date)	(STATUS: patented, pending, abandoned)

_____	_____	_____
(Application Serial No.)	(Filing Date)	(STATUS: patented, pending, abandoned)

I hereby revoke all previously granted powers of attorney and appoint the following attorneys: Robert E. Bushnell, Reg. No. 27,774, Michael D. Parker, Reg. No. 34,973, and Darren R. Crew, Reg. No. 37,806, to prosecute this application and to transact all business in the U.S. Patent & Trademark Office connected therewith and with any divisional, continuation, continuation-in-part, reissue or re-examination application, with full power of appointment and with full power to substitute an associate attorney or agent, and to receive all patents which may issue thereon, and request that all correspondence be addressed to:

Robert E. Bushnell,  
Attorney-at-Law  
Suite 300, 1522 "K" Street, N.W.  
Washington, D.C. 20005-1202

**Payor No. 008439**  
Area Code: 202-408-9040

I HEREBY DECLARE that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 U.S. Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF FIRST OR SOLE INVENTOR: JANG-HO PARK Citizenship: Republic of KOREA

Inventor's signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Residence & Post Office Address: 111-32, Maetan 2-dong, Paldal-ku, Suwon, Kyunggi-do, Republic of Korea

FULL NAME OF SECOND JOINT INVENTOR: DONG-WOOK KIM Citizenship: Republic of KOREA

Inventor's signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Residence & Post Office Address: Ga-202, Hoban Villa, 177-9, Songpa 2-dong, Songpa-ku, Seoul, Republic of Korea

FULL NAME OF THIRD JOINT INVENTOR: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Inventor's signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Residence & Post Office Address: \_\_\_\_\_

FULL NAME OF FOURTH JOINT INVENTOR: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Inventor's signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Residence & Post Office Address: \_\_\_\_\_